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FOREST INSECT CONDITIONS

in the Pacific Northwest during 1961

by
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and
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DIVISION OF TIMBER MANAGEMENT
PACIFIC NORTHWEST REGION
U.S. DEPARTMENT OF AGRICULTURE
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This is the 14th annual report of forest insect conditions in Oregon and Washington based on cooperative surveys sponsored by the Northwest Forest Pest Action Council. The combined efforts of many organizations and individuals made these surveys possible. Special acknowledgement is made to the principal cooperators: Oregon State Board of Forestry and Washington Department of Natural Resources.

On July 1, 1961 forest insect and disease survey and control responsibilities were transferred from the Pacific Northwest Forest and Range Experiment Station to the Division of Timber Management, U.S. Forest Service, Pacific Northwest Region.

COVER BACKGROUND: Egg galleries of the Western pine beetle, Dendroctonus brevicomis Lec., on the bark of ponderosa pine.

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U.S. Department of Agriculture

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SURVEY FINDINGS IN BRIEF

Epidemic outbreaks in the Pacific Northwest totaled 1,223,320 acres this year (Table 1). It is the lowest total for the 11 years for which the records are complete. The extent and intensity of outbreaks by insect species are given in the Appendix in table 22 for Oregon and in table 23 for Washington. Locations of the most extensive outbreaks are shown in figure 1 in the Appendix.

Principal findings of the 1961 survey were:

1. Mountain pine beetle.-- Outbreaks became more aggressive in western white pine stands on the Olympic Peninsula and along the Cascade Range in southern Washington and in northern Oregon. Losses also increased in the lodgepole pine stands, especially in south central Oregon. The infestations in ponderosa pine poles declined, except in the Blue Mountain region of Oregon.

2. Western pine beetle.-- Losses continued to decline in Washington and northern Oregon, but became more serious in central and southern Oregon, especially on the Fremont National Forest.

3. Douglas-fir beetle.-- Outbreaks subsided over most of the Region.

4. Spruce budworm.-- Damage became critical on the Yakima Indian Reservation and adjacent private lands in southern Washington. Epidemics in Oregon continued to subside.

5. Balsam woolly aphid.-- Damage increased in subalpine fir along the Oregon Cascades, but was variable in Pacific silver fir and grand fir.

6. Pine needle-sheath miner.-- Outbreaks on the Fremont National Forest increased in extent and severity but did not cause tree mortality.

7. Fir engraver.-- Outbreaks became more numerous in true fir stands in both Oregon and Washington.

8. Oregon pine ips.-- Infestations remained low, but indications are that a sharp increase occurred late in the season.

9. Western hemlock looper.--After an absence of 10 years, this defoliator reappeared in hemlock stands in northwestern Oregon and caused some tree mortality in localized areas.

Table 1.--Summary of 1961 forest insect epidemic infestations in Oregon and Washington

Insects[1/]	Oregon		Washington		Regional Total	
	Infestation centers	Area	Infestation centers	Area	Infestation centers	Area
	Number	Acres	Number	Acres	Number	Acres
DEFOLIATORS:						
Spruce budworm	19	55,200	3	29,600	22	84,800
Ponderosa pine needle miner	6	54,160	0	0	6	54,160
Western hemlock looper	2	11,000	0	0	2	11,000
Black-headed budworm	0	0	2	8,960	2	8,960
Western oak looper	2	6,880	0	0	2	6,880
Spruce bud moth	0	0	5	4,320	5	4,320
Larch looper	0	0	10	2,520	10	2,520
Pine needle-sheath miner	0	0	1	1,800	1	1,800
All defoliators	29	127,240	21	47,200	50	174,440
SUCKING INSECTS:						
Balsam woolly aphid	97	78,080	7	2,320	104	80,400
Pine needle scale	3	1,760	0	0	3	1,760
All sucking insects	100	79,840	7	2,320	107	82,160
BARK BEETLES:						
Mountain pine beetle (W)	231	114,380	239	291,760	470	406,140
Mountain pine beetle (L)	60	77,680	5	1,520	65	79,200
Mountain pine beetle (P)	37	16,640	7	1,200	44	17,840
Western pine beetle	159	180,040	28	12,760	187	192,800
Douglas-fir beetle	154	70,120	78	99,140	232	169,260
Fir engraver	102	43,720	40	17,800	142	61,520
Oregon pine ips	53	15,880	22	7,560	75	23,440
Engelmann spruce beetle	3	2,560	9	5,000	12	7,560
Douglas-fir engraver	0	0	8	5,440	8	5,440
Silver fir beetles	2	480	3	3,040	5	3,520
All bark beetles	801	521,500	439	445,220	1,240	966,720
All insects	928	728,580	467	494,740	1,397	1,223,320

1/ Mountain pine beetle infestations are separated by tree species: L, lodgepole pine; P, ponderosa pine; S, sugar pine; W, western white pine.

INTRODUCTION

Survey procedures were the same as in recent years. Epidemic infestations were detected, evaluated and mapped as to intensity from the air by standard methods.[1/] Ground surveys varied from an intensive and time-consuming evaluation of the spruce budworm egg populations to general checking to verify the accuracy of aerial mapping.

DEFOLIATORS

SPRUCE BUDWORM
Choristoneura fumiferana (Clem.)

Epidemic outbreaks of the spruce budworm were the least extensive since the records were begun in 1947.

The situation in Oregon improved considerably. Infestations on the Wallowa-Whitman National Forest subsided, and those on the Fremont National Forest are declining. Conditions worsened in southern Washington. The outbreak on the Yakima Indian Reservation and private lands on the adjacent Glenwood District increased in size and severity causing extensive top killing in certain locations.

A comparison of the recorded epidemic infestations during 1960 and 1961 is as follows:

	1960		1961	
Administrative Unit	Acres	Percent	Acres	Percent
Fremont N.F., Oreg.	215,760	76	55,200	65
Glenwood District, Wash.	14,240	5	22,400	26
Yakima Indian Reservation, Wash.	6,720	2	7,200	9
Wallowa-Whitman N.F., Oreg.	48,800	17	0	0
Regional total	285,520	100	84,400	100

1/ Wear, J. F., and Buckhorn, W. J. Organization and conduct of forest insect aerial surveys in Oregon and Washington. U. S. Forest Service Pac. N.W. Forest and Range Expt. Sta., 40 pp., illus. 1955. (Processed)

The 1961 egg mass evaluation survey[2/] indicated that the population trend on the Fremont National Forest will continue downward, except in one small area. The Yakima Indian Reservation-Glenwood District infestation trend is expected to be strongly upward in 1962.

The Spruce Budworm Committee of the Northwest Forest Pest Action Council was alerted to the critical situation existing on the Yakima-Glenwood outbreak. They reviewed the past history of the outbreak, results of the 1961 aerial surveys, and egg mass evaluation data, and then examined the infestation from the air and on the ground. The Committee submitted a report to the Council at the annual meeting at Portland on October 27. The Council considered the situation and recommended that the 47,500 acres of infestation, including necessary buffer zones, be sprayed from the air in the spring of 1962 to control the outbreak.

2/ Buffam, Paul E. Evaluation of 1961-62 spruce budworm populations in Oregon and Washington. U.S. Forest Service, 4 pp. Oct. 24,1961. (Processed).

Table 2.--Extent of spruce budworm infestations in Oregon and Washington in 1961, by control unit and intensity of infestation

(In acres)

Administrative area[1]/ and control unit	Intensity of infestation			All intensities
	Light	Moderate	Heavy	
Oregon:				
Fremont N.F.				
Gearhart Mountain	33,120	480	0	33,600
Warner Mountains	14,720	6,880	0	21,600
Total	47,840	7,360	0	55,200
Washington:				
Glenwood District (W.S.D.N.R.)				
Simcoe Ridge	14,240	5,120	3,040	22,400
Yakima I.R.				
Simcoe Ridge	3,680	2,240	1,280	7,200
Total	17,920	7,360	4,320	29,600
All units	65,760	14,720	4,320	84,800

1/ N.F., National Forest; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

PONDEROSA PINE NEEDLE MINER
Agyresthia sp.

This outbreak of unidentified needle miner has been in progress for four years on the Warner District of the Fremont National Forest, Oregon. This year the size and intensity of the infestation increased, but no tree mortality has occurred. However, the repeated defoliation may weaken the trees and make them attractive to attack by the western pine beetle.

Studies on the life history of this insect are in progress to determine the stage when control measures would be most effective.

WESTERN HEMLOCK LOOPER
Lambdina fiscellaria lugubrosa Hulst

After 10 years absence, this serious defoliator of western hemlock appeared in epidemic numbers in northwestern Oregon. Sizeable areas of light to heavy defoliation occurred in stands in the vicinity of Astoria, Oregon and some tree mortality resulted.

The large numbers of moths observed in many locations indicated that the infestation probably will continue strong in 1962. Additional feeding on partially defoliated trees could result in extensive mortality in these stands in 1962.

This information was presented to the Pacific Northwest Forest Pest Action Council at the annual meeting on October 27. After considering the facts and being aware of the destructive potential of this insect, the Council recommended aerial spraying of the infestation in 1962 to control this dangerous pest.

BLACK-HEADED BUDWORM
Acleris variana (Fern.)

Sizeable outbreaks of light epidemic appeared on the Olympic and Snoqualmie National Forests, Wash. Pacific silver fir and western hemlock were the tree species attacked.

The outbreak present during 1960 on the Mount Hood National Forest, Oreg. subsided without causing appreciable damage to the stand.

The past history of these outbreaks has been to subside within a year or two without causing lasting damage.

WESTERN OAK LOOPER
Lambdina fiscellaria somniaria (Hulst)

Outbreaks on Oregon white oak near Dallas and Monmouth, Oreg., continued for a second year. Almost complete defoliation occurred early in the summer, but refoliation was noted when larval feeding was finished. The history of these outbreaks has been that while they are spectacular, they usually subside after several years without causing permanent damage.

SPRUCE BUD MOTH
Zeiraphera ratzeburgiana Sax.

Small outbreaks of light to moderate intensity occurred in stands of young Sitka spruce at several locations on the west side of the Olympic Peninsula, Wash. Such outbreaks usually subside without causing serious damage to the stands.

LARCH LOOPER
Semiothisa sexmaculata (Pack.)

Aggressive outbreaks of this defoliator occurred in western larch stands on the Colville National Forest, Wash. The infestation extends along the south side of the Columbia River from Newport to the Canadian line. This outbreak is not considered serious at this time since larch can sustain several seasons defoliation before the situation becomes critical.

PINE NEEDLE-SHEATH MINER
Zellaria sp.

An outbreak appeared in lodgepole pine south of Olympia, Wash. in 1960. The infestation in 1961 increased in extent and intensity, but did not become serious. The spread of the infestation is limited, and the stands are somewhat isolated. Hence, control is not needed.

EUROPEAN PINE SHOOT MOTH
Rhyacionia buoliana (Schiff.)

The intensive cooperative survey was expanded to cover the majority of the susceptible areas of infestation in Oregon and Washington. In addition to known infestations in Seattle and Spokane, Wash., and Portland, Oreg., shoot moth infestations were found in six counties in Washington where it had not previously been reported: Lewis, Kitsap, Pacific, Skagit, Snohomish and Whatcom. In Oregon, new infestations were found in Marion and Clackamas Counties and more infested trees were found in the vicinity of Portland, Oreg. So far all infestations have been in nurseries or on ornamental pines. The insect was found in 15 species or varieties of ornamental pines of which Mugho and Scotch pine were the preferred hosts.

The infestation has evidently been spread by movement of infested nursery stock.

All known infested trees in Spokane, Wash. and Portland, Oreg., were destroyed this year. These areas will be resurveyed in 1962 and maintenance control will be done as needed. Intra and interstate quarantines have been established to prevent further movement of infested stock. Tests are underway to develop a practical fumigation schedule using methyl bromide.

CONE PYRALID
Dioryctria sp.

This moth is one of a group that feed in twigs and are destructive to cones. It was found attacking young Douglas-fir 3 to 20 feet in height on a plantation near Sweet Home, Oreg. The larvae had killed the leaders and some twig tips by burrowing in the pith.

The trees attacked by this insect are seldom killed outright, but repeated destruction of the terminals deforms the tree to a bushy shrub.

It was also reported near Lebanon, Oreg. and on portions of the Siskiyou National Forest. No control measures have been developed for use under forest conditions.

SAWFLIES
Neodiprion spp.

A light infestation of an unidentified species of sawfly reported last year on lodgepole pine near Tumwater, Wash. subsided.

The outbreak recorded on western larch on and near Mount Spokane in Washington also subsided without causing appreciable damage to the stand.

LARCH CASEBEARER
Coleophora laricella (Hübner)

The light epidemic detected in western larch stands on Mica Peak, near Spokane, Wash., in 1960 subsided without causing any apparent damage to the stands.

SUCKING INSECTS

BALSAM WOOLLY APHID
Chermes piceae (Ratz.)

Infestations in subalpine fir stands along the Cascade Mountains in Oregon increased in size and intensity (Table 3). The largest and most severe outbreaks occurred on the Willamette National Forest (Table 4). Mortality in Pacific silver fir and grand fir stands was variable, increasing on some areas and decreasing on others.

Efforts to effect biological control by colonizing foreign insect predators were continued. Several species have become established and show some promise of reducing aphid populations.

Table 3.--Trend of balsam woolly aphid infestations in Oregon and Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestations: Oregon	Washington	Regional total
1958	110,560	145,760	256,320
1959	50,880	108,480	159,360
1960	66,440	760	67,200
1961	78,080	2,320	80,400

Table 4.--Extent of balsam woolly aphid infestations in Oregon and Washington in 1961, by administrative area and intensity of infestation

Administrative area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	All intensities
	Number	Acres			
Oregon:					
Willamette N.F.	80	54,240	11,360	3,040	68,640
Umpqua N.F.	11	4,640	2,240	0	6,880
Mt. Hood N.F.	4	1,760	0	0	1,760
Deschutes N.F.	2	800	0	0	800
Oregon areas	97	61,440	13,600	3,040	78,080
Washington:					
Gifford Pinchot N.F.	5	320	1,760	0	2,080
Yakima I.R.	2	80	160	0	240
Washington areas	7	400	1,920	0	2,320
All areas	104	61,840	15,520	3,040	80,400

1/ N.F., National Forest; I.R., Indian Reservation.

PINE NEEDLE SCALE
Phenacaspis pinifoliae (Fitch)

This insect caused considerable damage to ponderosa pine stands near The Dalles and in the Hood River Valley of Oregon.

The buildup of these infestations is thought to be due to the reduction of predators and parasites caused by spray drift from orchards, but this has not been proven. So far the damage is not sufficient to warrant control measures on forest areas.

BARK BEETLES

MOUNTAIN PINE BEETLE
Dendroctonus monticolae Hopk.

Epidemic outbreaks increased sharply in 1961 (Table 5). The situation varied by tree species as follows:

Western white pine. The largest and most aggressive infestations occurred in the Gifford Pinchot and Wenatchee National Forests and in Olympic National Park in Washington. In Oregon, the bulk of the increased infestations occurred on the Willamette and Mt. Hood National Forests (Table 6).

Control of this insect in western white pine stands has been considered impractical because of the prevalence of blister rust. With the development of successful antibiotics for blister rust control, there is a need to reconsider control of the mountain pine in this species.

Lodgepole pine. Outbreaks continued to increase moderately in Oregon forests and decline in Washington forests. The largest increases occurred in Oregon on the Fremont and Winema (formerly Klamath Indian Reservation) National Forests. Elsewhere, moderate increases were noted. An infestation in Crater Lake National Park increased, but at a reduced rate (Table 7).

Maintenance control was carried out on several lodgepole pine stands in Crater Lake National Park. The feasibility of salvage control of a number of outbreaks on the Fremont and Winema National Forests is being investigated.

Ponderosa pine. Infestations in stagnated pole-sized stands increased in Oregon, but declined in Washington. The largest centers of damage occurred on the Wallowa-Whitman National Forest in Oregon (Table 8).

Thinning of dense ponderosa pine pole stands should relieve the stand pressure which is the underlying cause attracting the beetles.

Table 5.--Trend of mountain pine beetle infestations in Oregon and Washington, by host species, 1958-61[1]/

(In acres)

Year of detection	Area of epidemic infestations							Regional total, all species
	Oregon				Washington			
	W	L	P	S	W	L	P	
1958	32,160	32,640	2,560	0	190,880	5,920	0	268,160
1959	60,000	34,160	4,240	0	153,340	7,600	6,080	265,420
1960	31,040	40,080	14,520	480	209,400	6,440	4,740	306,700
1961	114,380	77,680	16,640	0	291,760	1,520	1,200	503,180

1/ Host species are: W, western white pine; L, lodgepole pine; P, ponderosa pine; S, sugar pine.

Table 6.--Extent of mountain pine beetle infestations in western white pine in Oregon and Washington in 1961, by administrative area and intensity of infestation

Administrative area[1/]	Infestation centers	Intensity of infestation				All intensities
		Light	Moderate	Heavy	Very Heavy	
	Number	---------- Acres ----------				
Oregon:						
Willamette N.F.	135	37,060	14,320	14,400	2,320	68,100
Mt. Hood N.F.	82	14,080	6,520	6,320	2,080	29,000
Umpqua N.F.	10	8,000	5,440	640	0	14,080
Deschutes N.F.	3	2,400	640	0	0	3,040
Siskiyou N.F.	1	160	0	0	0	160
Oregon areas	231	61,700	26,920	21,360	4,400	114,380
Washington:						
Gifford Pinchot N.F.	66	74,280	70,880	10,240	9,120	164,520
Olympic N.P.	49	23,360	22,800	0	0	46,160
Wenatchee N.F.	55	15,400	6,240	2,720	0	24,360
Mt. Baker N.F.	32	10,780	7,180	2,240	0	20,200
Olympic N.F.	17	5,000	9,760	0	0	14,760
Snoqualmie N.F.	46	12,320	480	0	0	12,800
Quinault I.R.	6	1,280	3,520	0	0	4,800
Mt. Rainier N.P.	9	2,400	960	0	0	3,360
San Juan Dist. (W.S.D.N.R.)	2	480	0	0	0	480
Colville N.F.	2	160	0	0	0	160
Glenwood Dist. (W.S.D.N.R.)	1	160	0	0	0	160
Washington areas	285	145,620	121,820	15,200	9,120	291,760
All areas	516	207,320	148,740	36,560	13,520	406,140

1/ N.F., National Forest; N.P., National Park; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

Table 7.--Extent of mountain pine beetle infestations in lodgepole pine in Oregon and Washington in 1961, by administrative area and intensity of infestation

Administrative area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Oregon:						
Winema N.F.	23	22,680	6,960	1,840	480	31,960
Fremont N.F.	13	3,040	8,800	9,920	3,520	25,280
Deschutes N.F.	12	5,500	320	3,340	0	9,160
Crater Lake N.P.	4	6,400	0	0	0	6,400
Umpqua N.F.	3	960	1,440	0	0	2,400
Warm Springs I.R.	2	1,360	0	0	0	1,360
Malheur N.F.	2	960	0	0	0	960
Wallowa-Whitman N.F.	1	160	0	0	0	160
Oregon areas	60	41,060	17,520	15,100	4,000	77,680
Washington:						
Wenatchee N.F.	2	320	320	0	0	640
Colville I.R.	1	640	0	0	0	640
Okanogan N.F.	2	240	0	0	0	240
Washington areas	5	1,200	320	0	0	1,520
All areas	65	42,260	17,840	15,100	4,000	79,200

1/ N.F., National Forest; N.P., National Park; I.R., Indian Reservation.

Table 8.--Extent of mountain pine beetle infestations in ponderosa pine in Oregon and Washington in 1961, by administrative area and intensity of infestation

Administrative area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	All intensities
	Number	Acres			
Oregon:					
Wallowa-Whitman N.F.	12	7,680	3,360	480	11,520
Fremont N.F.	10	480	640	320	1,440
Umatilla N.F.	3	400	800	0	1,200
Rogue River N.F.	7	160	640	160	960
Deschutes N.F.	1	640	0	0	640
Malheur N.F.	3	480	0	0	480
Warm Springs I.R.	1	0	400	0	400
Oregon areas	37	9,840	5,840	960	16,640
Washington:					
Colville I.R.	3	160	320	0	480
Colville N.F.	4	320	0	0	320
Wenatchee N.F.	1	0	160	0	160
N.E. Washington (W.S.D.N.R.)	2	0	160	0	160
Gifford Pinchot N.F.	1	80	0	0	80
Washington areas	11	560	640	0	1,200
All areas	48	10,400	6,480	960	17,840

1/ N.F., National Forest; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

WESTERN PINE BEETLE
Dendroctonus brevicomis Lec.

The trend of the western pine beetle increased in Oregon and decreased in Washington (Table 9). Populations were largely endemic in the ponderosa pine stands of Washington and on the Mount Hood, Deschutes, Umatilla, and Wallowa-Whitman National Forests in Oregon. The upward trend of infestation apparent in 1960 on the Fremont, Ochoco, and Malheur National Forests continued strong. Losses also developed on and adjacent to the Rogue River National Forest in southern Oregon. The situation became especially serious on the Fremont where severe losses occurred along Winter Ridge. A large scale sanitation-salvage program has been undertaken to control the largest and most aggressive of these outbreaks. Sanitation-salvage operations are also being stepped up at other active centers of infestation on other forests to reduce beetle populations.

Table 9.--Trend of western pine beetle infestations in Oregon and Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestations		Regional Total
	Oregon	Washington	
1958	96,640	56,080	152,720
1959	106,000	188,300	294,300
1960	142,520	18,300	160,820
1961	180,040	12,760	192,800

Table 10.--Extent of western pine beetle infestations in Oregon and Washington in 1961, by administrative area and intensity of infestation

Administrative area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number			Acres		
Oregon:						
Ochoco N.F.	33	48,800	8,480	0	0	57,280
Fremont N.F.	29	13,400	15,520	9,760	2,720	41,400
Malheur N.F.	21	30,160	2,560	0	0	32,720
Rogue River N.F.	47	16,920	2,240	0	0	19,160
Umatilla N.F.	18	9,920	0	0	0	9,920
Deschutes N.F.	8	4,960	960	0	0	5,920
Warm Springs I.R.	12	5,880	0	0	0	5,880
Winema N.F.	8	2,800	0	0	0	2,800
Wallowa-Whitman N.F.	4	2,600	0	0	0	2,600
Siskiyou N.F.	2	1,760	0	0	0	1,760
Mt. Hood N.F.	5	440	0	0	0	440
Umpqua N.F.	1	160	0	0	0	160
Oregon areas	188	137,800	29,760	9,760	2,720	180,040
Washington:						
Yakima I.R.	13	8,800	240	0	0	9,040
Gifford Pinchot N.F.	3	1,160	0	0	0	1,160
Wenatchee N.F.	4	960	0	0	0	960
Snoqualmie N.F.	2	800	0	0	0	800
Okanogan N.F.	2	0	480	0	0	480
Colville I.R.	3	280	0	0	0	280
Glenwood Dist. (W.S.D.N.R.)	1	40	0	0	0	40
Washington areas	28	12,040	720	0	0	12,760
All areas	216	149,840	30,480	9,760	2,720	192,800

1/ N.F., National Forest; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

DOUGLAS-FIR BEETLE
Dendroctonus pseudotsugae Hopk.

The trend of Douglas-fir beetle losses was strongly downward in Oregon and slightly downward in Washington (Table 11).

In Washington the trend was variable, increasing on some areas and decreasing on others (Table 12). The most aggressive center of epidemic appeared on private lands near Chewelah, Wash. The intensity of infestation on the large epidemics present on the Colville Indian Reservation and Okanogan National Forest declined considerably. The anticipated flare-up of infestation following the extensive blowdown in western Washington in 1958 failed to materialize, due largely to the aggressive program of salvaging the infested material before the beetles emerged. The widespread outbreak that started in western Oregon during 1957 has subsided. The outbreak that developed in the Blue Mountain region in 1960 is declining except on the Wallowa-Whitman National Forest where some increase occurred (Table 12). No direct control is needed; however, salvage of infested trees to reduce the insect population and utilize the timber before it deteriorates is recommended.

Table 11.--Trend of Douglas-fir beetle infestations in Oregon and Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestations: Oregon	Washington	Regional Total
1958	880,160	51,320	931,480
1959	292,520	32,320	324,840
1960	114,160	104,440	218,600
1961	70,120	99,140	169,260

Table 12.--Extent of Douglas-fir beetle infestations in Oregon and Washington in 1961, by administrative area and intensity of infestation

Administrative area 1/	Infestation centers	Intensity of Infestation				All intensities
		Light	Moderate	Heavy	Very Heavy	
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	65	24,480	7,840	320	0	32,640
Umatilla N.F.	46	22,080	2,400	0	0	24,480
Rogue River N.F.	19	8,840	520	0	0	9,360
Siskiyou N.F.	7	1,200	0	0	0	1,200
Mt. Hood N.F.	7	960	0	0	0	960
Siuslaw N.F.	5	800	0	0	0	800
Malheur N.F.	3	320	0	0	0	320
Umpqua N.F.	1	320	0	0	0	320
Winema N.F.	1	40	0	0	0	40
Oregon areas	154	59,040	10,760	320	0	70,120
Washington:						
Okanogan N.F.	40	47,860	1,600	0	0	49,460
Colville I.R.	7	12,120	8,480	0	0	20,600
Colville N.F.	20	8,000	1,960	960	800	11,720
Gifford Pinchot N.F.	18	8,640	800	0	0	9,440
Wenatchee N.F.	10	1,120	1,120	0	0	2,240
Kaniksu N.F.	4	1,880	0	0	0	1,880
Umatilla N.F.	8	1,800	0	0	0	1,800
San Juan Dist. (W.S.D.N.R.)	1	960	0	0	0	960
Glenwood Dist. (W.S.D.N.R.)	4	160	320	0	0	480
Mt. Baker N.F.	1	200	0	0	0	200
S.W. Washington (W.S.D.N.R.)	3	160	0	0	0	160
Snoqualmie N.F.	1	160	0	0	0	160
Spokane I.R.	1	40	0	0	0	40
Washington areas	118	83,100	14,280	960	800	99,140
All areas	272	142,140	25,040	1,280	800	169,260

1/ N.F., National Forest; I.R. Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

FIR ENGRAVER
Scolytus ventralis Lec.

Epidemic infestations in subalpine and white fir stands increased sharply (Table 13). Losses were particularly heavy in the Blue Mountain region and along the Cascade Range in Oregon.

In southern Oregon, a combination of root rot fungi and the fir engraver caused light mortality in some stands of Shasta red fir. Appreciable tree mortality also occurred on the Mt. Baker, Okanogan, and Wenatchee National Forests and on the Yakima Indian Reservation in Washington. Most of the losses caused by this insect were relatively unimportant because much of the damage was in defective overmature trees and in low value stands at high elevations.

Table 13.--Trend of fir engraver infestations in Oregon and Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestations		Regional Total
	Oregon	Washington	
1958	11,120	10,880	22,000
1959	15,520	18,640	34,160
1960	27,240	14,680	41,920
1961	43,720	17,800	61,520

OREGON PINE IPS
Ips oregoni (Eichh.)

The infestation trend was generally downward over the region except south of Spokane, Wash. where ponderosa pine is growing on marginal sites (Table 14). Large portions of this area were burned in 1960 and epidemics of this beetle flared up within and adjacent to these burns. In other parts of the region there are indications that some buildup of population occurred late in the season due to the abnormally long, hot, dry summer.

Most outbreaks usually decline after one season, hence direct control measures are usually not warranted. Proper handling of logging and thinning slash will minimize the possibility of a severe epidemic developing. However, under some circumstances, control may become necessary to prevent extensive losses.

Table 14.--Trend of Oregon pine ips infestations in Oregon and Washington 1958-61

(In acres)

Year of detection	Area of epidemic infestations: Oregon	Washington	Regional Total
1958	7,680	3,320	11,000
1959	37,440	25,800	63,240
1960	38,160	3,360	41,520
1961	15,880	7,560	23,440

ENGELMANN SPRUCE BEETLE
Dendroctonus engelmanni Hopk.

Engelmann spruce beetle infestations increased slightly in both states, but remain well below the critical level (Table 15). The bulk of the damage in Washington occurred along stream bottoms on the Wenatchee National Forest. All of the epidemic outbreaks in Oregon occurred on the Wallowa-Whitman National Forest.

Outbreaks are in small isolated stands where there is little danger of the infestation spreading. Hence, direct control is not needed.

DOUGLAS-FIR ENGRAVER
Scolytus unispinosus Lec.

Outbreaks of this insect occurred in young Douglas-fir stands on dry sites on the Kaniksu and Colville National Forests in Washington. No damage was detected in Oregon. Infestations of this insect generally develop during dry years then quickly subside when growing conditions improve. Control is not necessary.

Table 15.--Trend of Engelmann spruce beetle infestations in Oregon and Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestation: Oregon	Washington	Regional Total
1958	4,640	3,840	8,480
1959	4,800	3,520	8,320
1960	1,840	3,120	4,960
1961	2,560	5,000	7,560

SILVER FIR BEETLES
Pseudohylesinus spp.

Beetle-caused losses in true fir stands increased slightly in both States (Table 16). Losses occurred as scattered, individual trees in the stands. In Washington the infestation increased to epidemic proportions on the Snoqualmie National Forest. In Oregon above normal losses appeared near Astoria.

There is no practical direct control means available. Salvage logging of the dead and dying trees is about all that can be done to reduce the infestations.

Table 16.--Trend of silver fir beetle infestations in western Oregon and western Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestation: Oregon	Washington	Regional Total
1958	0	4,720	4,720
1959	320	32,800	33,120
1960	0	3,120	3,120
1961	480	3,040	3,520

OTHER FOREST PROBLEMS

Dying Hemlock

The acreage of mature western hemlock dying from unknown causes decreased in Oregon, but increased sharply in extent and intensity in Washington (Table 17). The most extensive and severe losses in Washington were recorded on and near the Olympic, Mount Baker, and Snoqualmie National Forests, Olympic National Park and the Southwest Washington District. In Oregon mature hemlock stands near Astoria sustained the majority of the loss (Table 18).

Table 17.--Trend of dying western hemlock in western Oregon and western Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestation		Regional Total
	Oregon	Washington	
1958	0	46,400	46,400
1959	6,240	138,880	145,120
1960	2,000	33,120	35,120
1961	480	353,040	353,520

Table 18.--Extent of dying hemlock in Oregon and Washington in 1961

by administrative area and intensity of infestation

Administrative area	Infestation centers	Intensity of Infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Oregon:						
N.W. Oregon	1	480	0	0	0	480
Washington:						
Mt. Baker N.F.	80	29,840	79,760	28,800	4,920	143,320
Olympic N.F.	38	44,960	41,760	35,520	0	122,240
Olympic N.P.	12	37,920	19,040	9,440	0	66,400
S.W. Washington	10	4,800	8,960	0	0	13,760
Snoqualmie N.F.	8	3,840	1,280	0	0	5,120
Gifford Pinchot N.F.	3	1,880	0	0	0	1,880
Quinault I.R.	1	320	0	0	0	320
Washington total	152	123,560	150,800	73,760	4,920	353,040
Regional total	153	124,040	150,800	73,760	4,920	353,520

Bear Damage

The extent of bear damage to young Douglas-fir and hemlock increased sharply in both Oregon and Washington (Table 19). The majority of this damage occurred in already understocked stands on and adjacent to the southwest Washington District and on the Olympic, Gifford Pinchot, and Snoqualmie National Forests in Washington. In Oregon, the principal centers of damage were on the Willamette, Siuslaw, and Mount Hood National Forests and on the Northwest Oregon District. (Table 20).

Table 19.--Trend of bear damage in western Oregon and western Washington, 1958-61

(In acres)

Year of detection	Area of epidemic infestation		Regional Total
	Oregon	Washington	
1958	54,700	118,500	173,200
1959	102,160	17,920	120,080
1960	33,720	18,980	52,700
1961	129,920	113,400	243,320

Table 20.--Extent of bear damage in Oregon and Washington in 1961

by administrative area and intensity of infestation

Administrative area	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Oregon:						
N.W. Oregon	42	42,080	6,880	2,240	0	51,200
Willamette N.F.	23	36,640	6,400	1,760	0	44,800
Siuslaw N.F.	18	13,200	6,240	0	0	19,440
Mt. Hood N.F.	9	9,840	640	0	0	10,480
Siskiyou N.F.	1	3,520	0	0	0	3,520
Rogue River N.F.	1	480	0	0	0	480
Oregon total	94	105,760	20,160	4,000	0	129,920
Washington:						
Olympic N.F.	34	57,980	15,360	4,960	2,400	80,700
Gifford Pinchot N.F.	17	7,020	2,560	0	0	9,580
S.W. Washington	11	6,560	6,720	0	0	13,280
Snoqualmie N.F.	9	1,600	6,000	320	0	7,920
Quinault I.R.	3	1,600	320	0	0	1,920
Washington total	74	74,760	30,960	5,280	2,400	113,400
Regional total	168	180,520	51,120	9,280	2,400	243,320

APPENDIX

Organization and Conduct of the Aerial Survey

The aerial phase of the regional survey was made cooperatively by three organizations: Oregon State Board of Forestry, Washington State Department of Natural Resources, and the U.S. Forest Service. Flying time totaled 226.1 hours (Table 21). Most of the survey flights were made between July 7 and August 18; the remainder were made in October.

Table 21.--Summary of cooperative aerial survey activities in 1961

Area covered	Timbered Area Surveyed	Survey time		
		Mapping	Ferrying	Total
	M acres	------ Hours ------		
Western Oregon	14,815	56.5	0.6	57.1
Eastern Oregon	12,492	56.1	5.7	61.8
Western Washington	13,069	58.3	7.3	65.6
Eastern Washington	11,660	38.7	2.9	41.6
All areas	52,036	209.6	16.5	226.1

Table 22.--Extent of epidemic infestations in Oregon in 1961, by forest area, insect species, and intensity of infestation

Administrative area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Deschutes N.F. and adjacent forest lands:						
Balsam woolly aphid	2	800	0	0	0	800
Mountain pine beetle (W)	3	2,400	640	0	0	3,040
Mountain pine beetle (L)	12	5,500	320	3,340	0	9,160
Mountain pine beetle (P)	1	640	0	0	0	640
Western pine beetle	8	4,960	960	0	0	5,920
Fir engraver	1	480	0	0	0	480
All insects	27	14,780	1,920	3,340	0	20,040
Fremont N.F. and adjacent forest lands:						
Spruce budworm	19	47,840	7,360	0	0	55,200
Ponderosa pine needle miner	6	28,400	18,240	7,520	0	54,160
Mountain pine beetle (L)	13	3,040	8,800	9,920	3,520	25,280
Mountain pine beetle (P)	10	480	640	320	0	1,440
Western pine beetle	29	13,400	15,520	9,760	2,720	41,400
Fir engraver	20	3,120	1,640	1,280	0	6,040
Oregon pine ips	1	0	0	160	0	160
All insects	98	96,280	52,200	28,960	6,240	183,680

See footnotes at end of table.

Table 22.--Extent of epidemic infestations in Oregon in 1961 ... (Continued)

Administrative area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Malheur N.F. and adjacent forest lands:						
Mountain pine beetle (L)	2	960	0	0	0	960
Mountain pine beetle (P)	3	480	0	0	0	480
Western pine beetle	21	30,160	2,560	0	0	32,720
Douglas-fir beetle	3	320	0	0	0	320
Fir engraver	4	800	960	0	0	1,760
Oregon pine ips	5	800	1,440	0	0	2,240
All insects	38	33,520	4,960	0	0	38,480
Mt. Hood N.F. and adjacent forest lands:						
Balsam woolly aphid	4	1,760	0	0	0	1,760
Pine needle scale	3	0	1,280	320	160	1,760
Mountain pine beetle (W)	82	14,080	6,520	6,320	2,080	29,000
Western pine beetle	5	440	0	0	0	440
Douglas-fir beetle	7	960	0	0	0	960
Fir engraver	2	560	0	0	0	560
All insects	103	17,800	7,800	6,640	2,240	34,480
Bear	9	9,840	640	0	0	10,480
All damage	112	27,640	8,440	6,640	2,240	44,960

See footnotes at end of table.

Table 22.--Extent of epidemic infestations in Oregon in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Ochoco N.F. and adjacent forest lands:						
Western pine beetle	33	48,800	8,480	0	0	57,280
Fir engraver	11	3,440	1,920	0	0	5,360
All insects	44	52,240	10,400	0	0	62,640
Rogue River N.F. and adjacent forest lands:						
Mountain pine beetle (P)	7	160	640	160	0	960
Western pine beetle	47	16,920	2,240	0	0	19,160
Douglas-fir beetle	19	8,840	520	0	0	9,360
Fir engraver	8	6,240	160	640	0	7,040
Oregon pine ips	28	4,800	1,120	0	0	5,920
All insects	109	36,960	4,680	800	0	42,440
Bear	1	480	0	0	0	480
All damage	110	37,440	4,680	800	0	42,920

See footnotes at end of table.

Table 22.--Extent of epidemic infestations in Oregon in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Siskiyou N.F. and adjacent forest lands:						
Mountain pine beetle (W)	1	160	0	0	0	160
Western pine beetle	2	1,760	0	0	0	1,760
Douglas-fir beetle	7	1,200	0	0	0	1,200
Oregon pine ips	3	2,880	480	0	0	3,360
All insects	13	6,000	480	0	0	6,480
Bear	1	3,520	0	0	0	3,520
All damage	14	9,520	480	0	0	10,000
Siuslaw N.F. and adjacent forest lands:						
Western oak looper	2	0	5,760	960	160	6,880
Douglas-fir beetle	5	800	0	0	0	800
All insects	7	800	5,760	960	160	7,680
Bear	18	13,200	6,240	0	0	19,440
All damage	25	14,000	12,000	960	160	27,120

See footnotes at end of table.

Table 22.--Extent of epidemic infestations in Oregon in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Umatilla N.F. and adjacent forest lands:						
Mountain pine beetle (P)	3	400	800	0	0	1,200
Western pine beetle	18	9,920	0	0	0	9,920
Douglas-fir beetle	46	22,080	2,400	0	0	24,480
Fir engraver	17	6,000	1,280	0	0	7,280
Oregon pine ips	4	560	960	0	0	1,520
All insects	88	38,960	5,440	0	0	44,400
Umpqua N.F. and adjacent forest lands:						
Balsam woolly aphid	11	4,640	2,240	0	0	6,880
Mountain pine beetle (W)	10	8,000	5,440	0	640	14,080
Mountain pine beetle (L)	3	960	1,440	0	0	2,400
Western pine beetle	1	160	0	0	0	160
Douglas-fir beetle	1	320	0	0	0	320
Fir engraver	4	800	160	0	0	960
All insects	30	14,880	9,280	0	640	24,800

See footnotes at end of table.

Table 22.--Extent of epidemic infestations in Oregon in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Wallowa-Whitman N.F. and adjacent forest lands:						
Mountain pine beetle (L)	1	160	0	0	0	160
Mountain pine beetle (P)	12	7,680	3,360	480	0	11,520
Western pine beetle	4	2,600	0	0	0	2,600
Douglas-fir beetle	65	24,480	7,840	320	0	32,640
Fir engraver	17	5,760	320	480	0	6,560
Oregon pine ips	12	1,360	1,000	320	0	2,680
Engelmann spruce beetle	3	2,560	0	0	0	2,560
All insects	114	44,600	12,520	1,600	0	58,720
Willamette N.F. and adjacent forest lands:						
Balsam woolly aphid	80	54,240	11,360	3,040	0	68,640
Mountain pine beetle (W)	135	37,060	14,320	14,400	2,320	68,100
Fir engraver	6	1,600	1,600	0	0	3,200
All insects	221	92,900	27,280	17,440	2,320	139,940
Bear	23	36,640	6,400	1,760	0	44,800
All damage	244	129,540	33,680	19,200	2,320	184,740

See footnotes at end of table.

Table 22.--Extent of epidemic infestations in Oregon in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation				All intensities
		Light	Moderate	Heavy	Very Heavy	
	Number	Acres				
Winema N.F. and adjacent forest lands:						
Mountain pine beetle (L)	23	22,680	6,960	1,840	480	31,960
Western pine beetle	8	2,800	0	0	0	2,800
Douglas-fir beetle	1	40	0	0	0	40
Fir engraver	6	2,160	1,360	0	0	3,520
All insects	38	27,680	8,320	1,840	480	38,320
Crater Lake N.P.						
Mountain pine beetle (L)	4	6,400	0	0	0	6,400
Fir engraver	2	480	0	0	0	480
All insects	6	6,880	0	0	0	6,880
Warm Springs I.R.:						
Mountain pine beetle (L)	2	1,360	0	0	0	1,360
Mountain pine beetle (P)	1	0	400	0	0	400
Western pine beetle	12	5,880	0	0	0	5,880
Fir engraver	1	160	0	0	0	160
All insects	16	7,400	400	0	0	7,800

See footnotes at end of table.

Table 22.--Extent of epidemic infestations in Oregon in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation				All intensities
		Light	Moderate	Heavy	Very Heavy	
	Number	Acres				
Lookout Mtn. (B.L.M.)						
Fir engraver	3	0	320	0	0	320
Northwest Oregon (O.S.B.F.)						
Western Hemlock looper	2	9,520	1,240	240	0	11,000
Silver fir beetles	2	0	480	0	0	480
All insects	4	9,520	1,720	240	0	11,480
Bear	42	42,080	6,880	2,240	0	51,200
Dying hemlock	1	480	0	0	0	480
All damage	47	52,080	8,600	2,480	0	63,160

1/ Mountain pine beetle damage has been separated by tree species attacked: L, lodgepole pine; P, ponderosa pine; W, western white pine.

2/ Administrative areas are abbreviated as follows: N.F., National Forest; B.L.M., Bureau of Land Management; N.P., National Park; I.R., Indian reservation; O.S.B.F., Oregon State Board of Forestry.

Table 23.--Extent of epidemic infestations in Washington in 1961, by forest area, insect species, and intensity of infestation

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Colville N.F. and adjacent forest lands:						
Larch looper	10	160	560	520	1,280	2,520
Mountain pine beetle (W)	2	160	0	0	0	160
Mountain pine beetle (P)	4	320	0	0	0	320
Douglas-fir beetle	20	8,000	1,960	960	800	11,720
Fir engraver	1	160	0	0	0	160
Oregon pine ips	1	40	0	0	0	40
Engelmann spruce beetle	2	800	0	0	0	800
Douglas-fir engraver	1	0	0	160	0	160
All insects	41	9,640	2,520	1,640	2,080	15,880
Gifford Pinchot N.F. and adjacent forest lands:						
Balsam woolly aphid	5	320	1,760	0	0	2,080
Mountain pine beetle (W)	66	74,280	70,880	10,240	9,120	164,520
Mountain pine beetle (P)	1	80	0	0	0	80
Western pine beetle	3	1,160	0	0	0	1,160
Douglas-fir beetle	18	8,640	800	0	0	9,440
All insects	93	84,480	73,440	10,240	9,120	177,280
Bear	17	7,020	2,560	0	0	9,580
Dying hemlock	3	1,880	0	0	0	1,880
All damage	113	93,380	76,000	10,240	9,120	188,740

See footnotes at end of table.

Table 23.--Extent of epidemic infestations in Washington in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Kaniksu N.F. and adjacent forest lands:						
Douglas-fir beetle	4	1,880	0	0	0	1,880
Fir engraver	4	1,280	0	0	0	1,280
Oregon pine ips	2	360	0	0	0	360
Engelmann spruce beetle	1	80	0	0	0	80
Douglas-fir engraver	5	640	800	0	0	1,440
All insects	16	4,240	800	0	0	5,040
Mt. Baker N.F. and adjacent forest lands:						
Mountain pine beetle (W)	32	10,780	7,180	2,240	0	20,200
Douglas-fir beetle	1	200	0	0	0	200
Fir engraver	3	160	1,120	1,760	0	3,040
All insects	36	11,140	8,300	4,000	0	23,440
Dying hemlock	80	29,840	79,760	28,800	4,920	143,320
All damage	116	40,980	88,060	32,800	4,920	166,760

See footnotes at end of table.

Table 23.--Extent of epidemic infestations in Washington in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Okanogan N.F. and adjacent forest lands:						
Mountain pine beetle (L)	2	0	240	0	0	240
Western pine beetle	2	0	480	0	0	480
Douglas-fir beetle	40	47,860	1,600	0	0	49,460
Fir engraver	13	3,440	1,920	0	0	5,360
Engelmann spruce beetle	3	800	40	0	0	840
All insects	60	52,100	4,280	0	0	56,380
Olympic N.F. and adjacent forest lands:						
Black-headed budworm	1	2,400	0	0	0	2,400
Spruce budmoth	1	1,600	0	0	0	1,600
Mountain pine beetle (W)	17	5,000	9,760	0	0	14,760
Fir engraver	0	160	0	0	0	160
All insects	19	9,160	9,760	0	0	18,920
Bear	34	57,980	15,360	4,960	2,400	80,700
Dying hemlock	38	44,960	41,760	35,520	0	122,240
All damage	91	112,100	66,880	40,480	2,400	221,860

See footnotes at end of table.

Table 23.--Extent of epidemic infestations in Washington in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation				All intensities
		Light	Moderate	Heavy	Very Heavy	
	Number	---------- Acres ----------				
Snoqualmie N.F. and adjacent forest lands:						
Black-headed budworm	1	6,560	0	0	0	6,560
Mountain pine beetle (W)	46	12,320	480	0	0	12,800
Western pine beetle	2	800	0	0	0	800
Douglas-fir beetle	1	160	0	0	0	160
Fir engraver	2	480	0	0	0	480
Engelmann spruce beetle	2	160	1,120	0	0	1,280
Silver fir beetles	3	2,080	960	0	0	3,040
All insects	57	22,560	2,560	0	0	25,120
Bear	9	1,600	6,000	320	0	7,920
Dying hemlock	8	3,840	1,280	0	0	5,120
All damage	74	28,000	9,840	320	0	38,160
Umatilla N.F. and adjacent forest lands:						
Douglas-fir beetle	8	1,800	0	0	0	1,800
Fir engraver	2	320	480	0	0	800
Oregon pine ips	4	800	200	0	0	1,000
All insects	14	2,920	680	0	0	3,600

See footnotes at end of table.

Table 23.--Extent of epidemic infestations in Washington in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Wenatchee N.F. and adjacent forest lands:						
Mountain pine beetle (W)	55	15,400	6,240	2,720	0	24,360
Mountain pine beetle (L)	2	320	320	0	0	640
Mountain pine beetle (P)	1	0	160	0	0	160
Western pine beetle	4	960	0	0	0	960
Douglas-fir beetle	10	1,120	1,120	0	0	2,240
Fir engraver	6	800	800	0	0	1,600
Engelmann spruce beetle	2	480	320	320	240	1,360
All insects	80	19,080	8,960	3,040	240	31,320
Mt. Rainier N.P.						
Mountain pine beetle (W)	9	2,400	960	0	0	3,360
Olympic N.P.						
Spruce budmoth	1	0	640	0	0	640
Mountain pine beetle (W)	49	23,360	22,800	0	0	46,160
Fir engraver	2	1,280	0	0	0	1,280
All insects	52	24,640	23,440	0	0	48,080
Dying hemlock	12	37,920	19,040	9,440	0	66,400
All damage	64	62,560	42,480	9,440	0	114,480

See footnotes at end of table.

Table 23.--Extent of epidemic infestations in Washington in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Colville I.R.:						
Mountain pine beetle (L)	1	640	0	0	0	640
Mountain pine beetle (P)	3	160	320	0	0	480
Western pine beetle	3	280	0	0	0	280
Douglas-fir beetle	7	12,120	8,480	0	0	20,600
Oregon pine ips	1	320	0	0	0	320
Engelmann spruce beetle	1	640	0	0	0	640
Douglas-fir engraver	1	320	0	0	0	320
All insects	17	14,480	8,800	0	0	23,280
Quinault I.R.:						
Mountain pine beetle (W)	6	1,280	3,520	0	0	4,800
Bear	3	1,600	320	0	0	1,920
Dying hemlock	1	320	0	0	0	320
All damage	10	3,200	3,840	0	0	7,040
Spokane I.R.:						
Douglas-fir beetle	1	40	0	0	0	40
Oregon pine ips	5	240	0	0	0	240
All insects	6	280	0	0	0	280

See footnotes at end of table.

Table 23.--Extent of epidemic infestations in Washington in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Yakima I.R.:						
Spruce budworm	1	3,680	2,240	1,280	0	7,200
Balsam woolly aphid	2	80	160	0	0	240
Western pine beetle	13	8,800	240	0	0	9,040
Fir engraver	2	1,960	0	0	0	1,960
All insects	18	14,520	2,640	1,280	0	18,440
Glenwood District (W.S.D.N.R.):						
Spruce budworm	2	14,240	5,120	3,040	0	22,400
Mountain pine beetle (W)	1	160	0	0	0	160
Western pine beetle	1	40	0	0	0	40
Douglas-fir beetle	4	160	320	0	0	480
Fir engraver	2	160	80	0	0	240
Oregon pine ips	2	40	0	0	0	40
All insects	12	14,800	5,520	3,040	0	23,360
San Juan District (W.S.D.N.R.):						
Mountain pine beetle (W)	2	480	0	0	0	480
Douglas-fir beetle	1	960	0	0	0	960
All insects	3	1,440	0	0	0	1,440

See footnotes at end of table.

DOMINION OF CANADA

PACIFIC OCEAN

CALIFORNIA

IDAHO

WASHINGTON

OREGON

VANCOUVER ISLAND

GEORGIA STRAIT

STRAIT OF JUAN DE FUCA

FIGURE I

GENERALIZED AREAS OF FOREST INSECT EPIDEMICS IN OREGON AND WASHINGTON

SEASON OF 1961

LEGEND

Spruce budworm	84,800 Acres
Balsam woolly aphid	80,400 Acres
Douglas-fir beetle	169,260 Acres
Western pine beetle	192,800 Acres
Mountain pine beetle	503,100 Acres

Based on cooperative aerial and ground surveys
coordinated by

DIVISION OF TIMBER MANAGEMENT FOREST SERVICE R-6
U.S. DEPARTMENT OF AGRICULTURE
1961

SCALE 10 0 10 20 30 40 MILES

Table 23.--Extent of epidemic infestations in Washington in 1961 ... (Continued)

Administrative area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very Heavy	All intensities
	Number	Acres				
Northeast Washington (W.S.D.N.R.):						
Mountain pine beetle (P)	2	80	80	0	0	160
Fir engraver	3	1,440	0	0	0	1,440
Oregon pine ips	7	5,480	80	0	0	5,560
Douglas-fir engraver	1	0	3,520	0	0	3,520
All insects	13	7,000	3,680	0	0	10,680
Southwest Washington (W.S.D.N.R.):						
Spruce budmoth	3	1,600	480	0	0	2,080
Pine needle-sheath miner	1	1,440	360	0	0	1,800
Douglas-fir beetle	3	160	0	0	0	160
All insects	7	3,200	840	0	0	4,040
Bear	11	6,560	6,720	0	0	13,280
Dying hemlock	10	4,800	8,960	0	0	13,760
All damage	28	14,560	16,520	0	0	31,080

1/ Mountain pine beetle damage has been separated by tree species attacked: L,lodgepole pine; P, ponderosa pine; W, western white pine.

2/ Administrative areas are abbreviated as follows: NF, National Forest; I.R., Indian Reservation; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources.